Jun 22nd, 11:00 AM - 11:15 AM

Stream Crossings II: Bridges, Culverts, Flood Resiliency, and Connectivity

Roy Schiff
Milone and MacBroom

James MacBroom
Milone and MacBroom

Jessica Louisos
Milone and MacBroom

Matthew Gardner
Milone and MacBroom

Bridges, Culverts, Flood Resiliency, and Connectivity

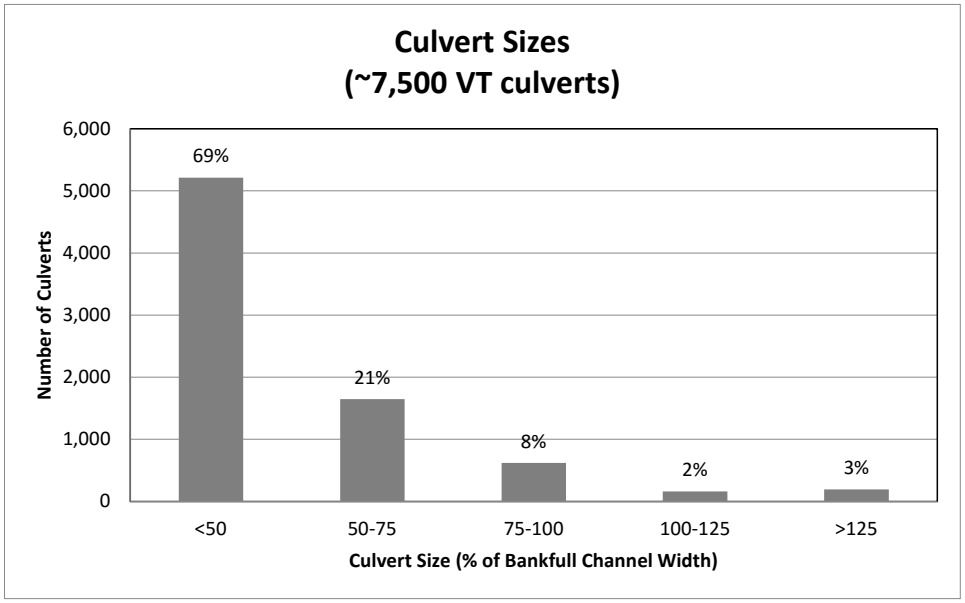
Presented By

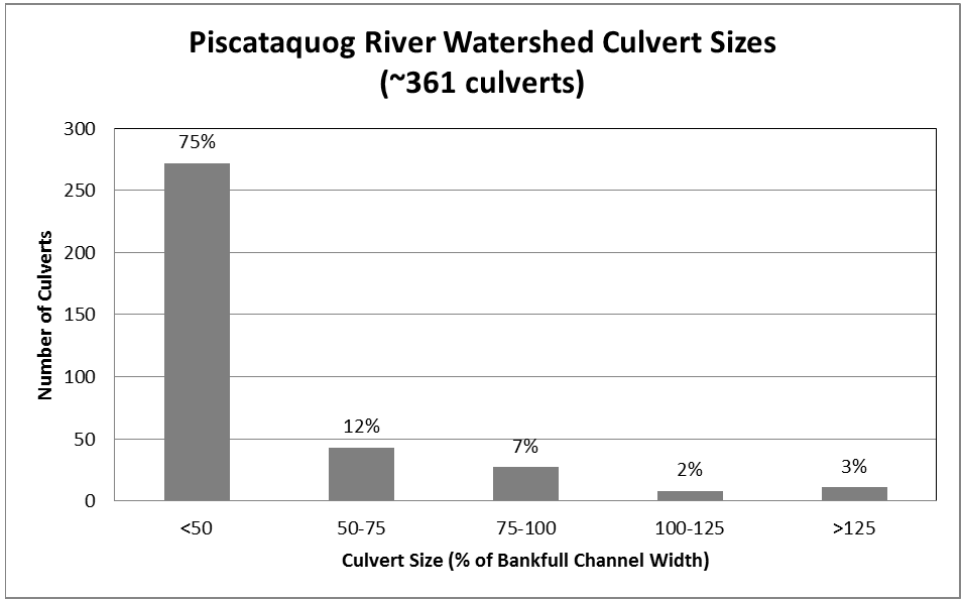
Roy Schiff
James MacBroom
Jessica Louisos
Matthew Gardner

MILONE & MACBROOM

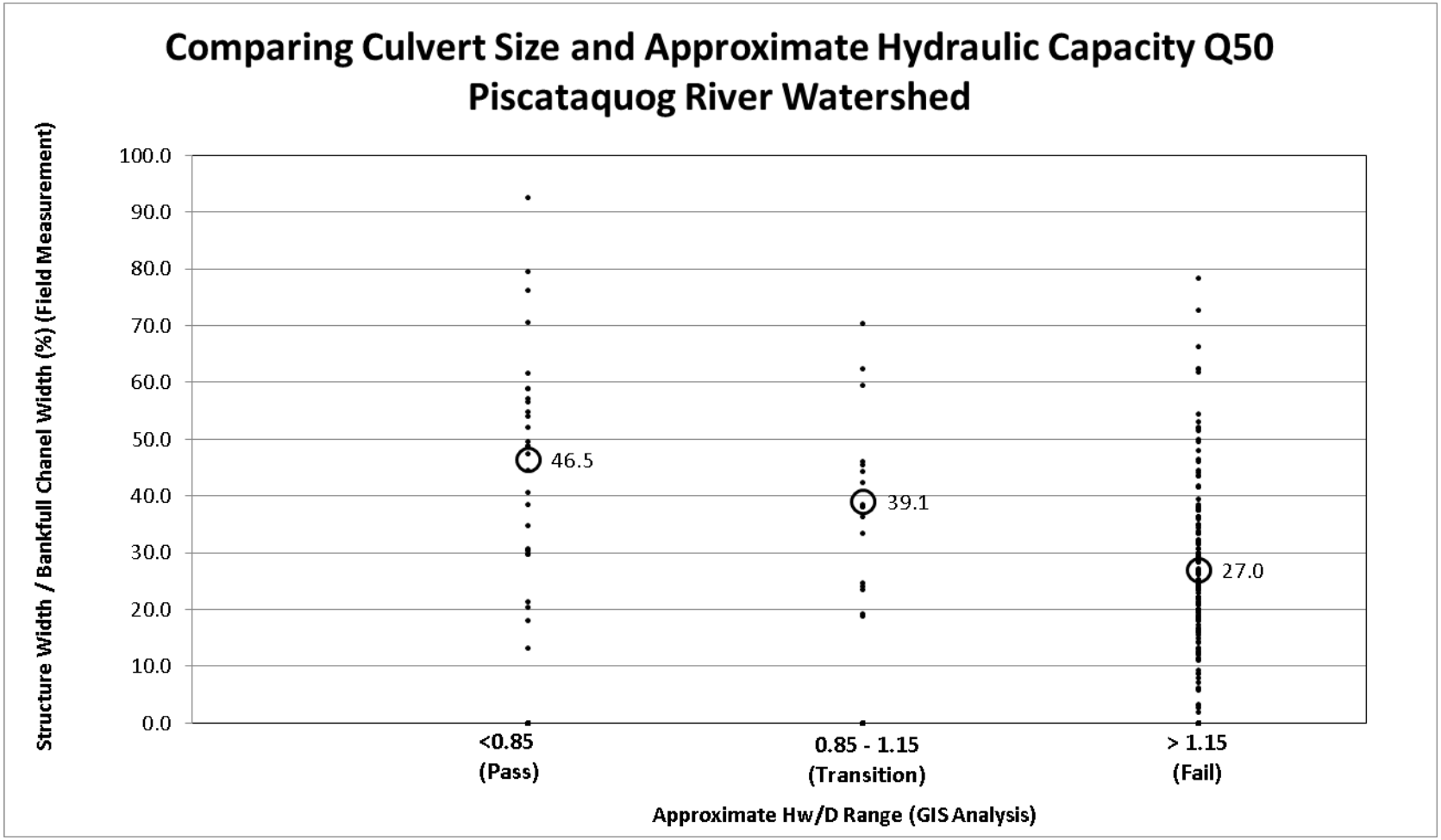
Fish Passage 2016 – International Conference on River Connectivity | June 22, 2016

Undersized Culverts

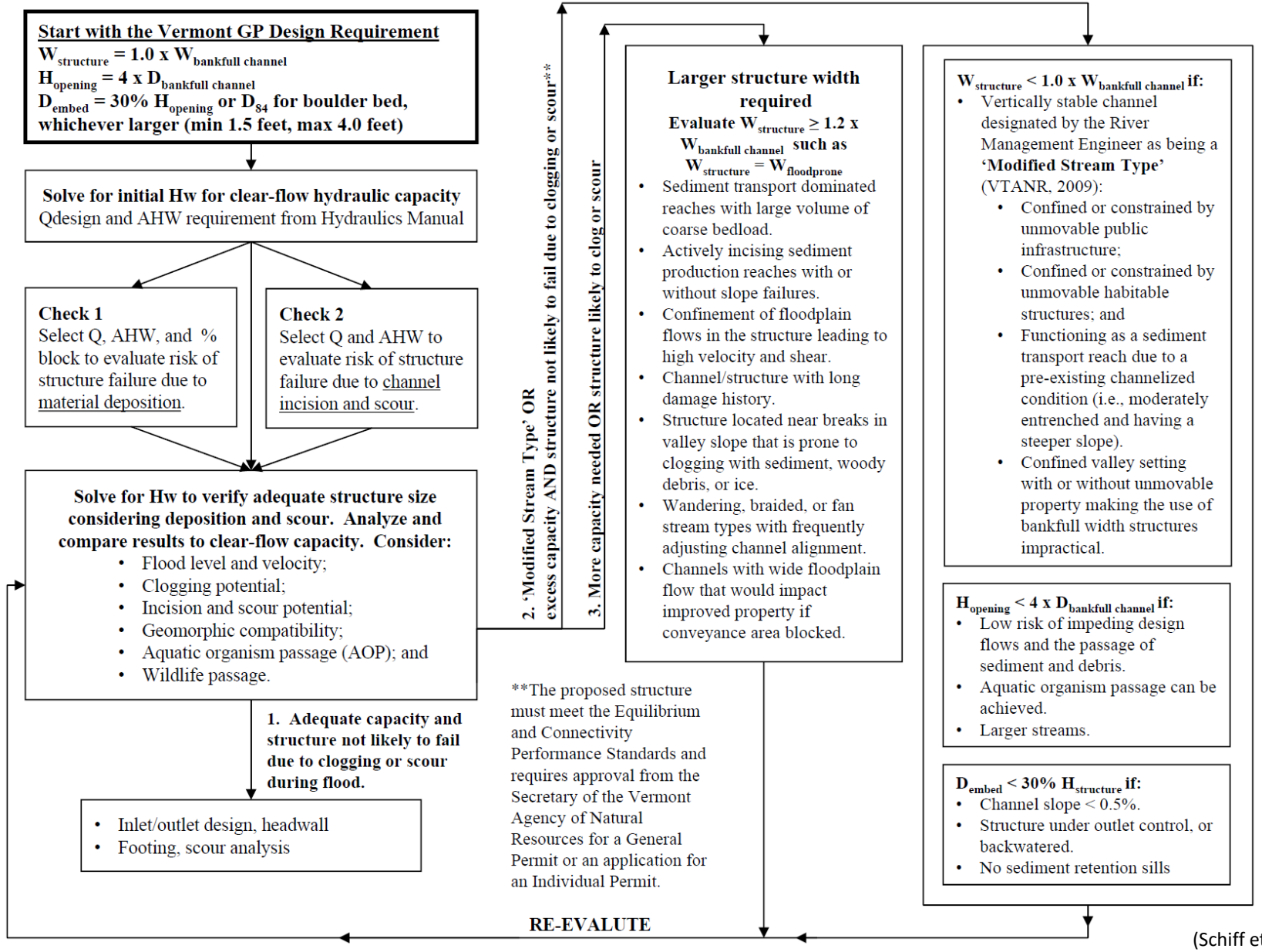




Undersized Culverts

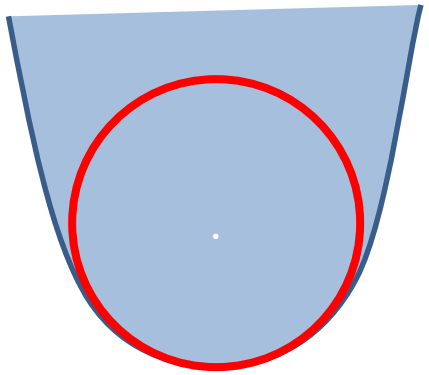


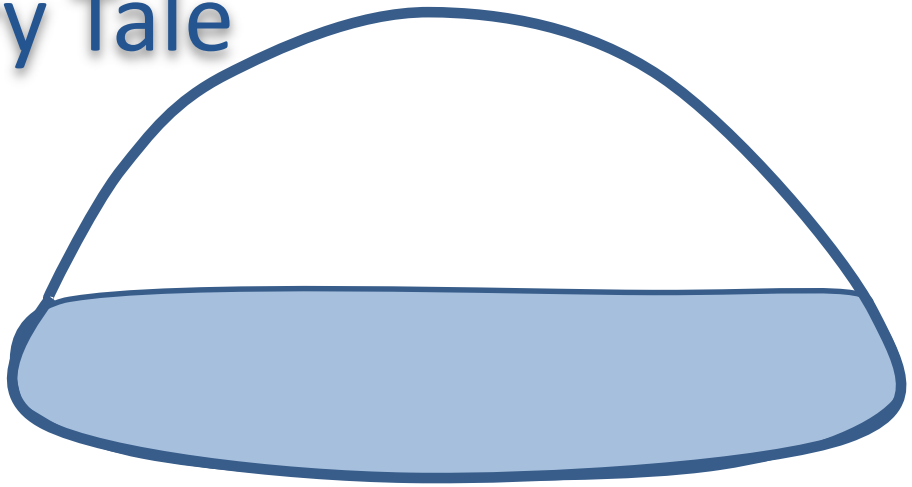
Recent VT Design Guidance & State Standards



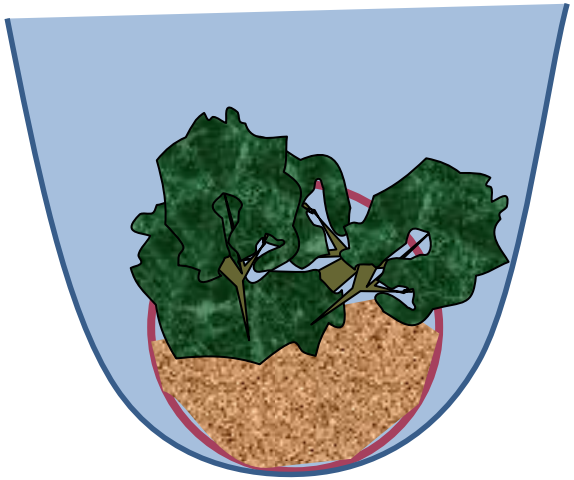
(Schiff et al., 2014)

The Clear Flow Fairy Tale

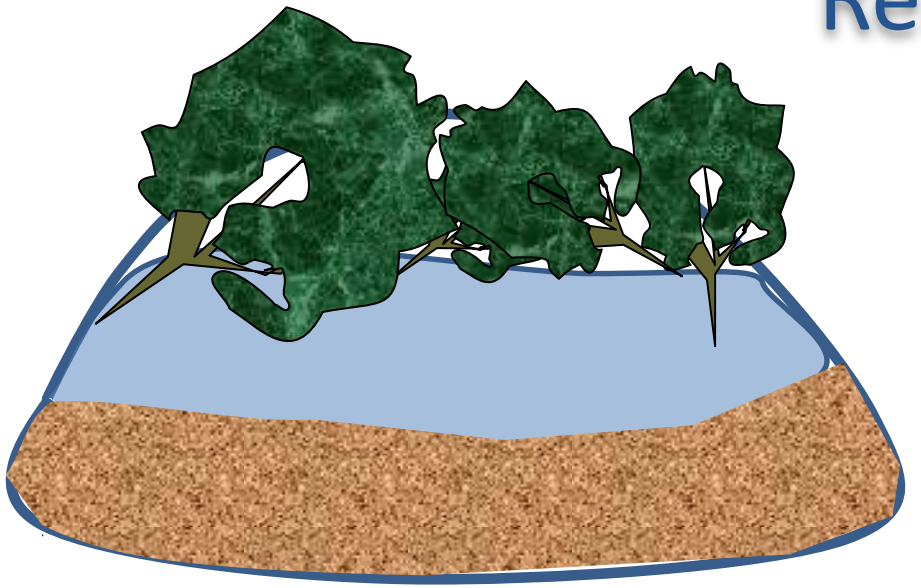


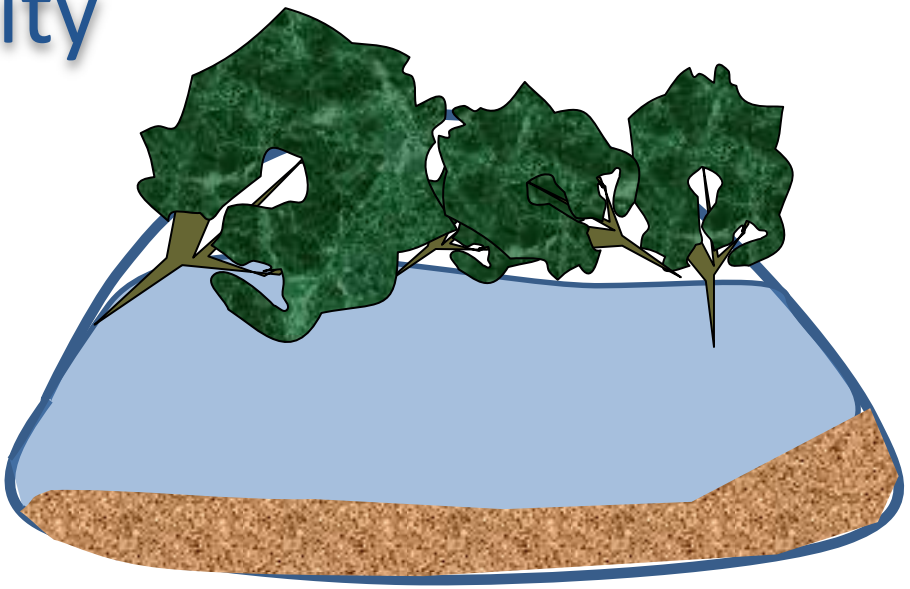


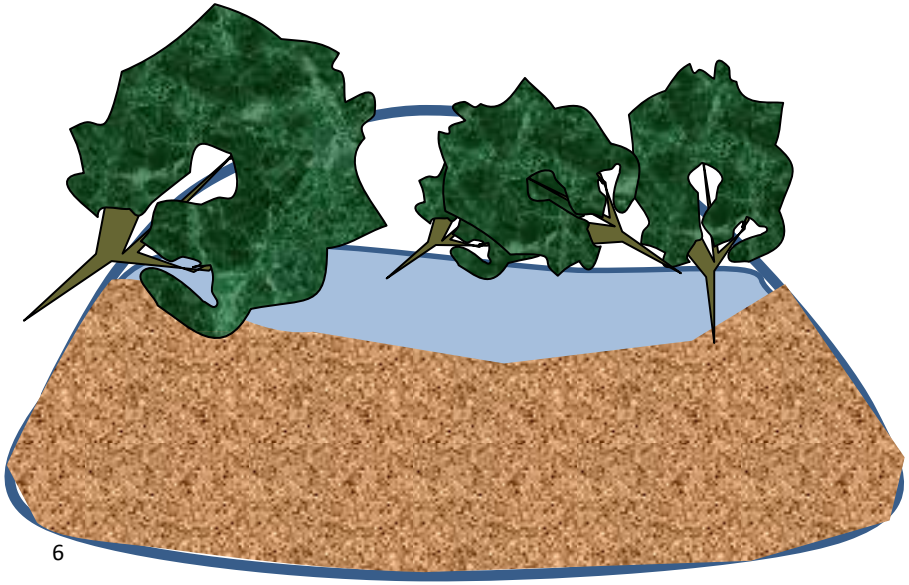
The Large Wood and Sediment Reality

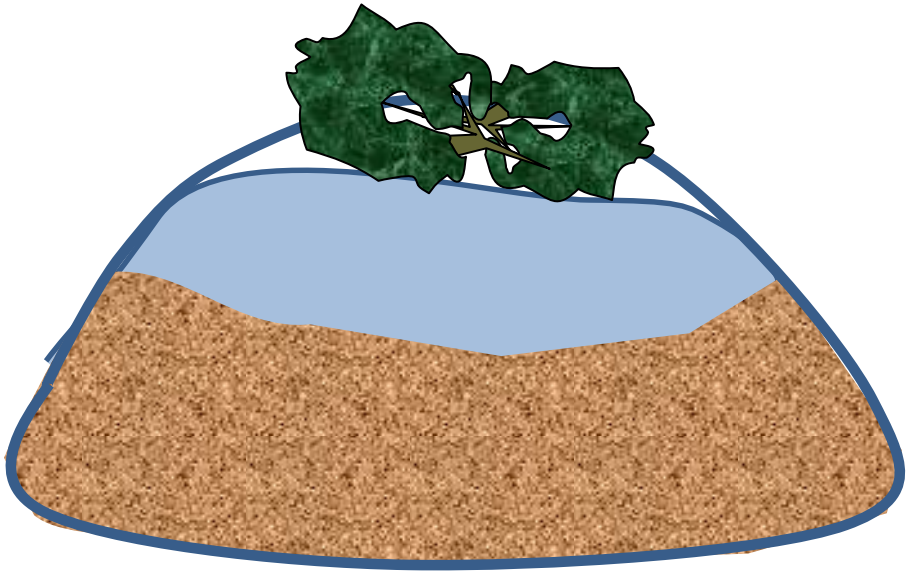


The Scary Part of Reality

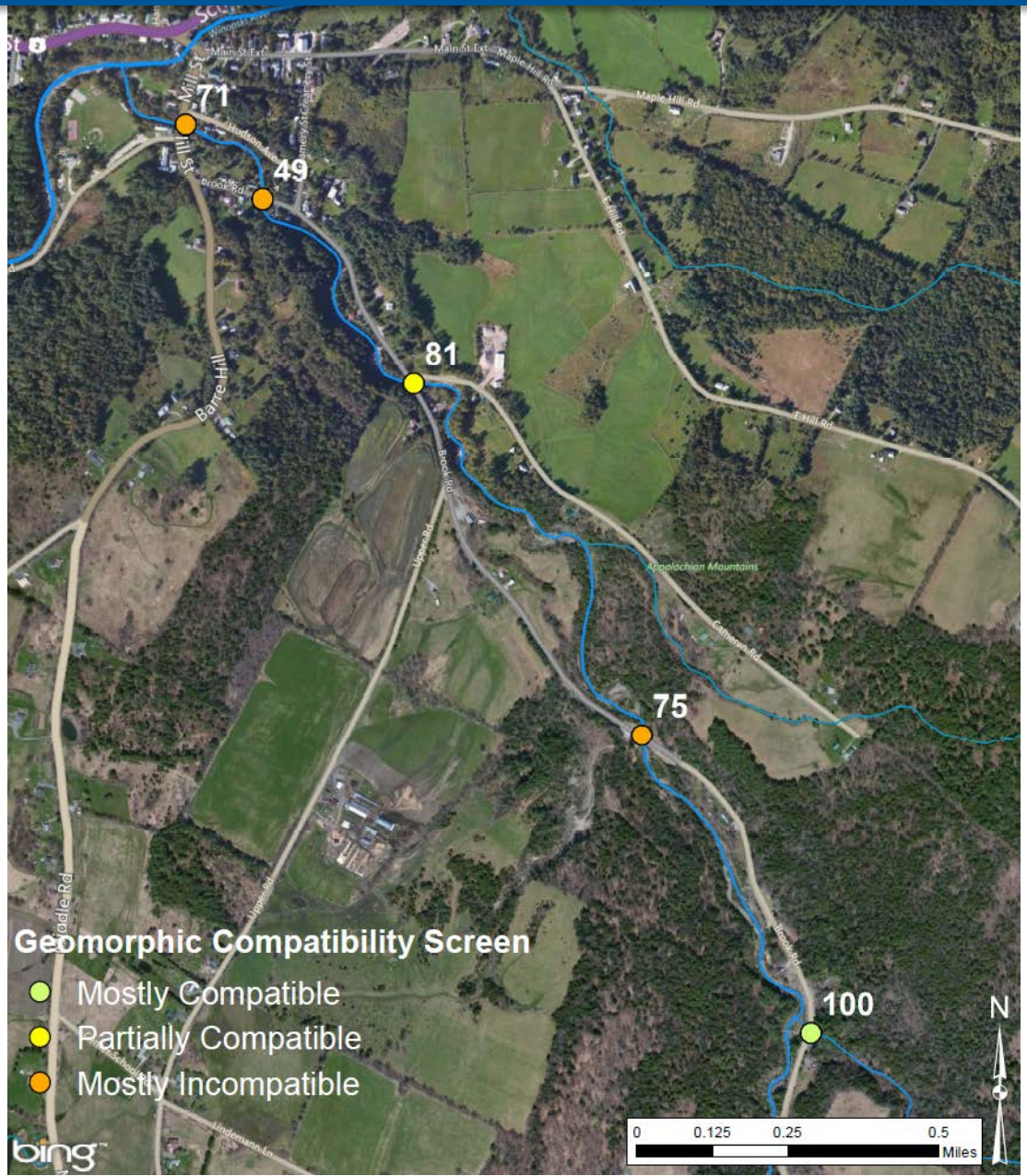








Undersized Bridges

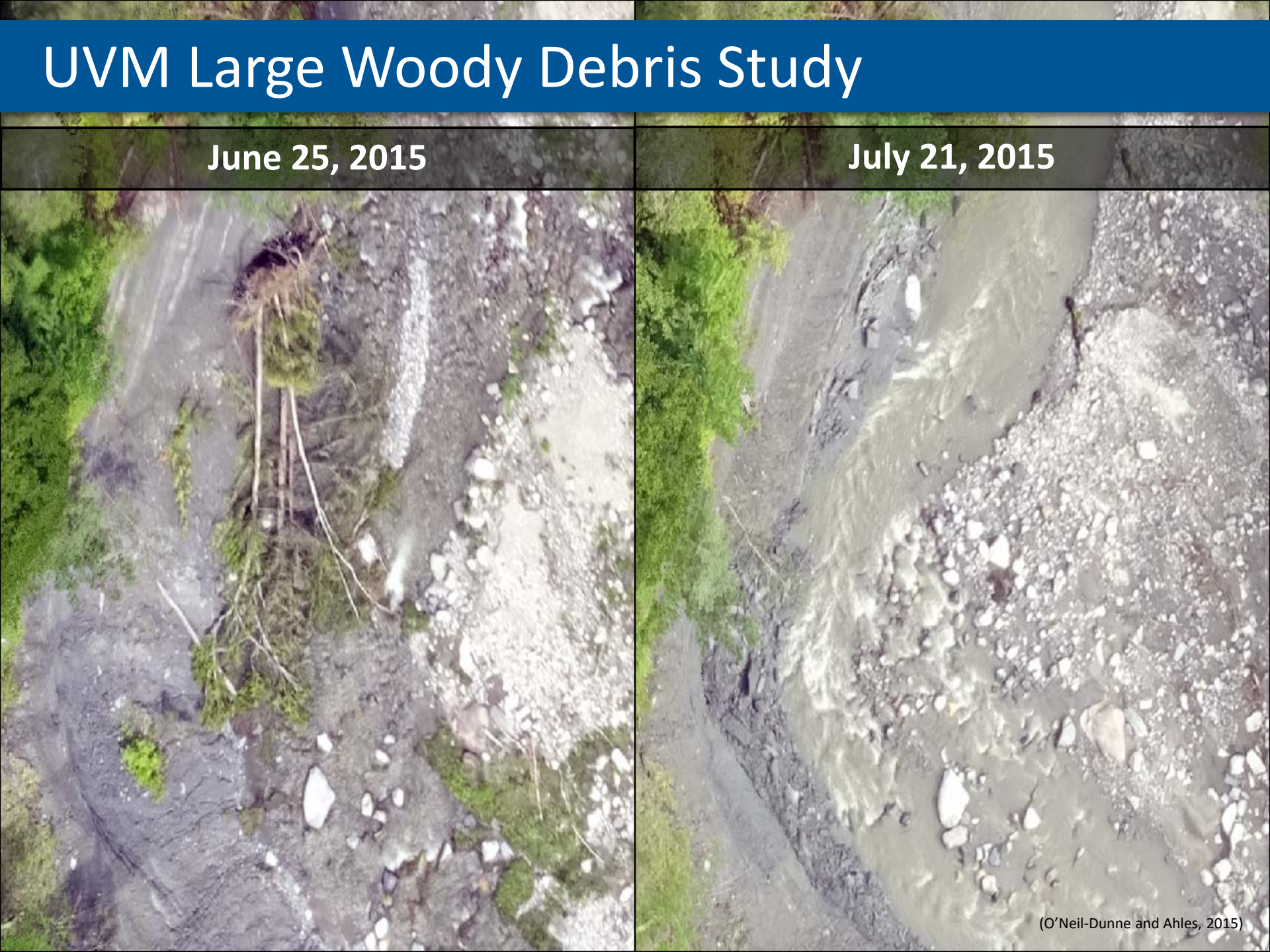


Large Wood at Bridges

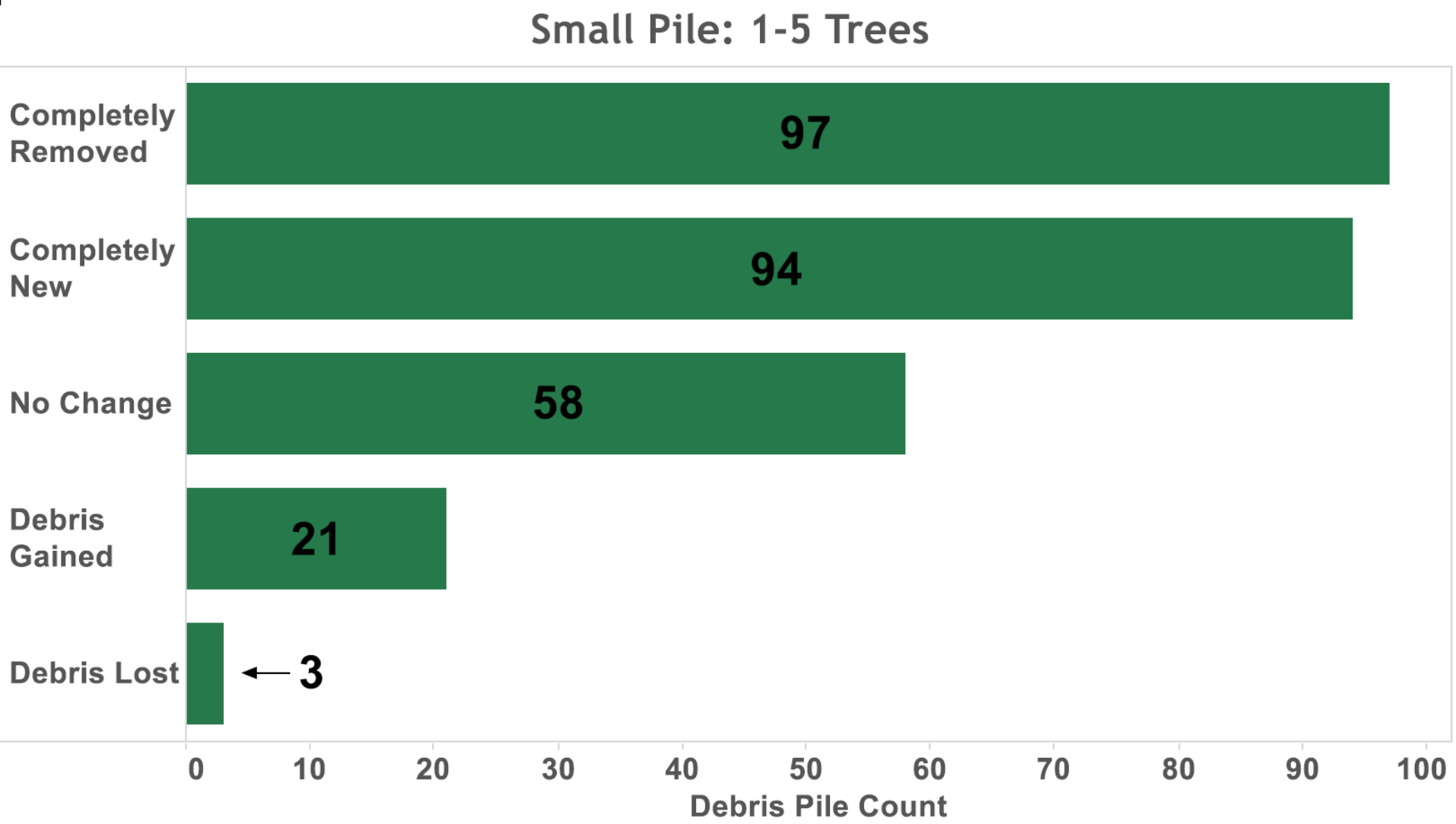
Great Brook
Brook Road in Plainfield, VT
7/19/2015
Photo taken by B. Towbin

Great Brook
Brook Road in Plainfield, VT
5/27/2011
Photo taken by G. Springston

UVM Large Woody Debris Study



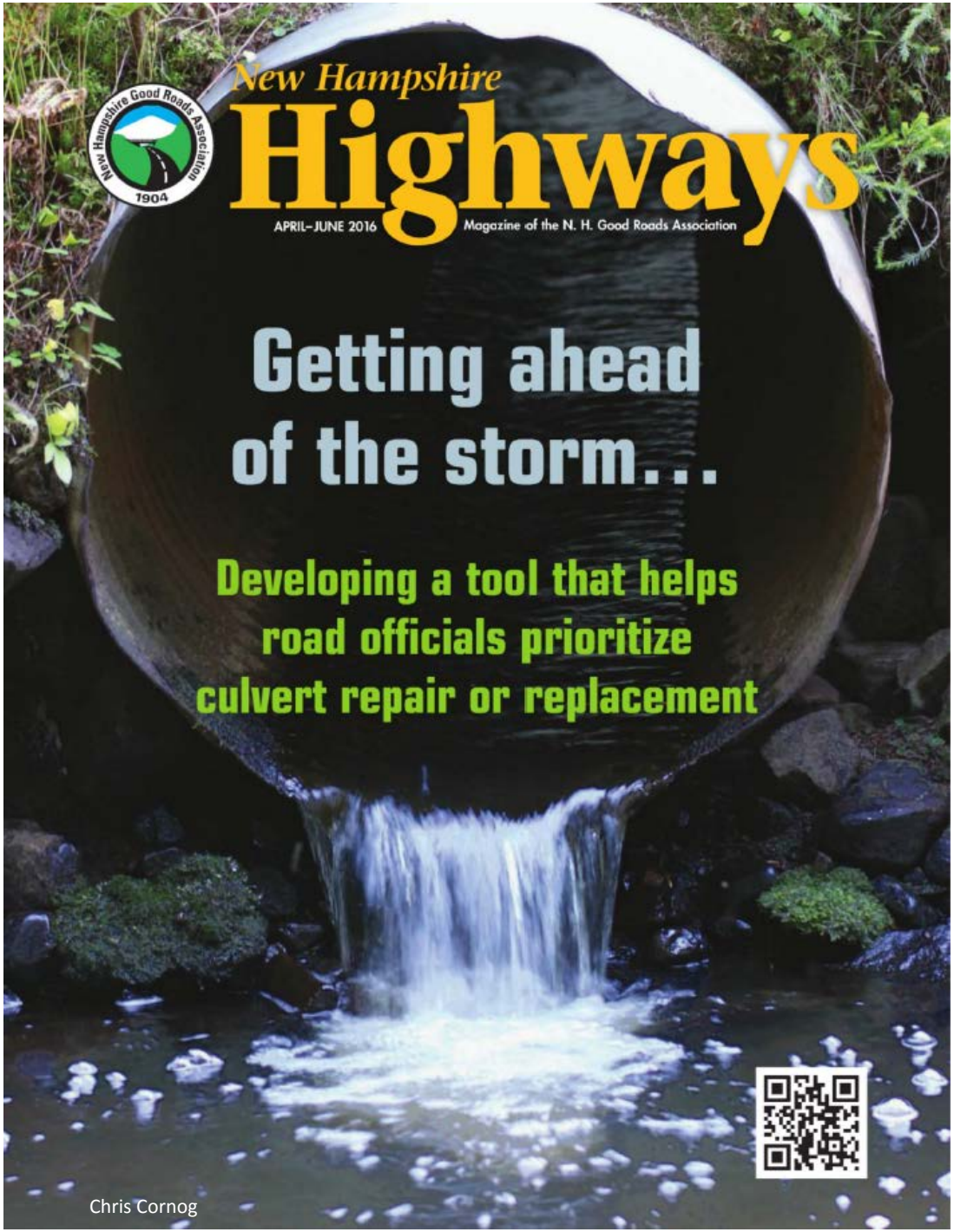
UVM Large Woody Debris Study



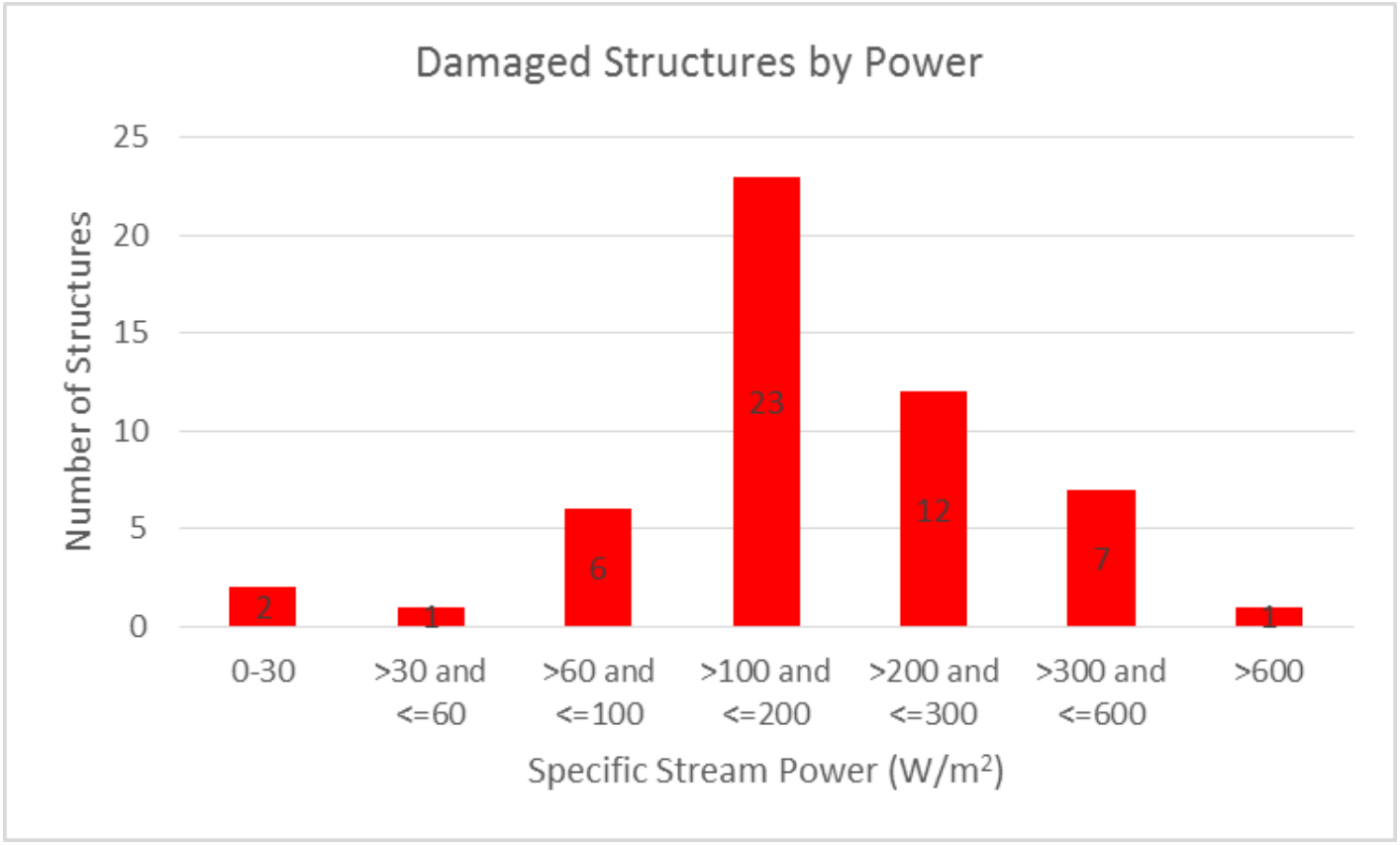
(O'Neil-Dunne and Ahles, 2015)

Poor Bridge Alignment

Roaring Brook
US Route 4 in Killington, VT
Photo by Lars Gange &
Mansfield Heliflight, August
31, 2011)


New Hampshire
Highways
APRIL–JUNE 2016
Magazine of the N. H. Good Roads Association
Getting ahead of the storm...
Developing a tool that helps road officials prioritize culvert repair or replacement
Chris Cornog

MA Culvert Vulnerability Screening

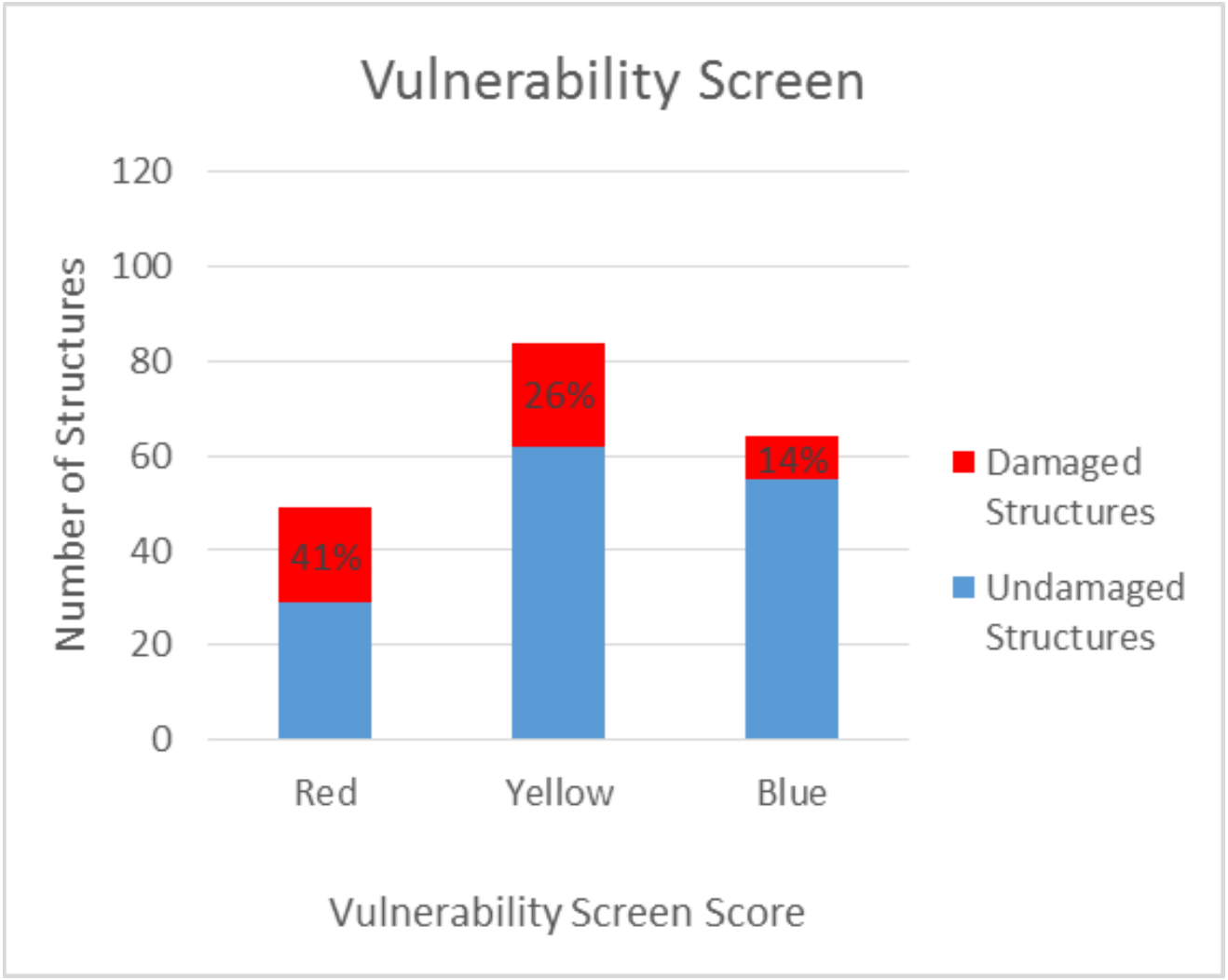


Specific Stream Power versus Bed Resistance

Specific Stream Power (W/m^2)	Dominant Particle Size (Bed Resistance)					
	Silt	Sand	Gravel	Cobble	Boulder	Bedrock
0-60	3	3	2	3	4	4
60-100	3	3	0	1	3	3
100-300	3	2	0	0	2	2
300+	2	1	0	0	1	2

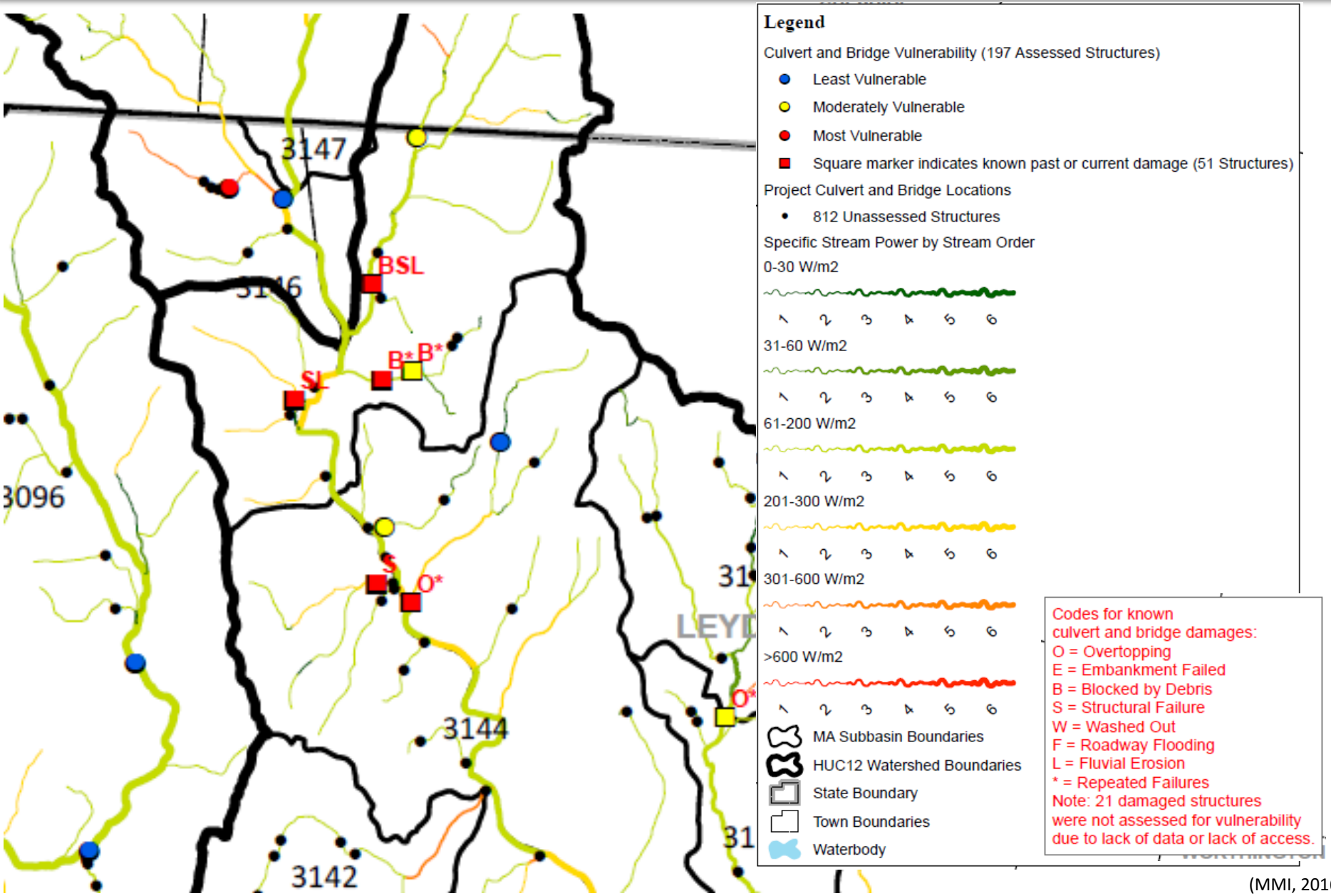
(MMI, 2016)

MA Culvert Vulnerability Screening



(MMI, 2016)

MA Culvert Vulnerability Screening

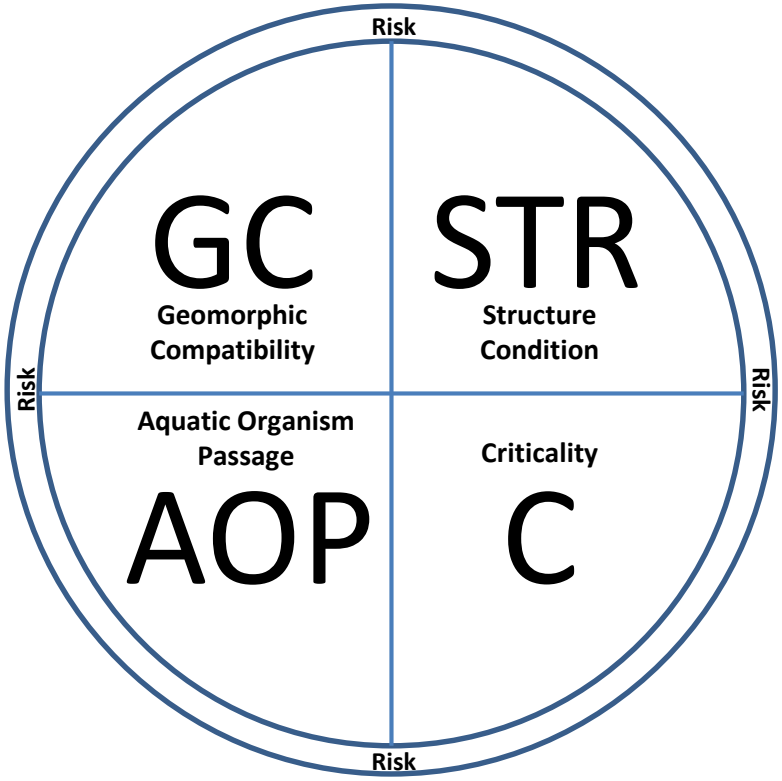


(MMI, 2016)

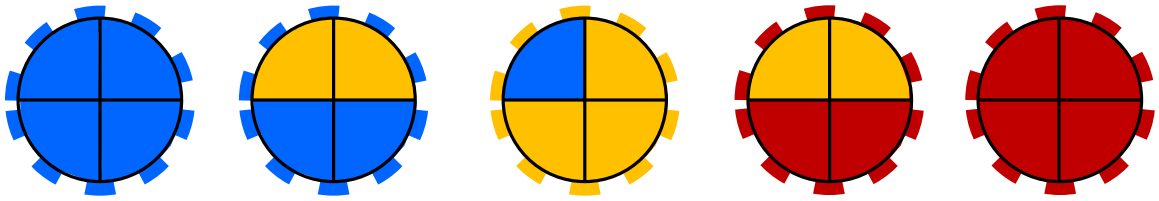
NH Draft Screen

Draft Culvert Scoring System (V.5)

Variable	Base Screen	Enhanced Screen
GC (Geomorphic Compatibility)	NH Geomorphic Compatibility (NHGS)	GC + Specific Stream Power and Approximate Bed Resistance
STR (Structure Condition)	Structural Condition	STR + Approximate Hydraulic Capacity (TU/SNHPC)
AOP (Aquatic Organism Passage)	NH Aquatic Organism Passage Screen (TU/SNHPC)	AOP + Fisheries Prioritization (NHFG)
C (Criticality)	NHDOT Road Class	Road Class + Public Safety Proximity + Locally important conditions (for locally enhanced screen)
R (Risk)	R = f(GC, STR, C)	R = f(GC, STR, C)



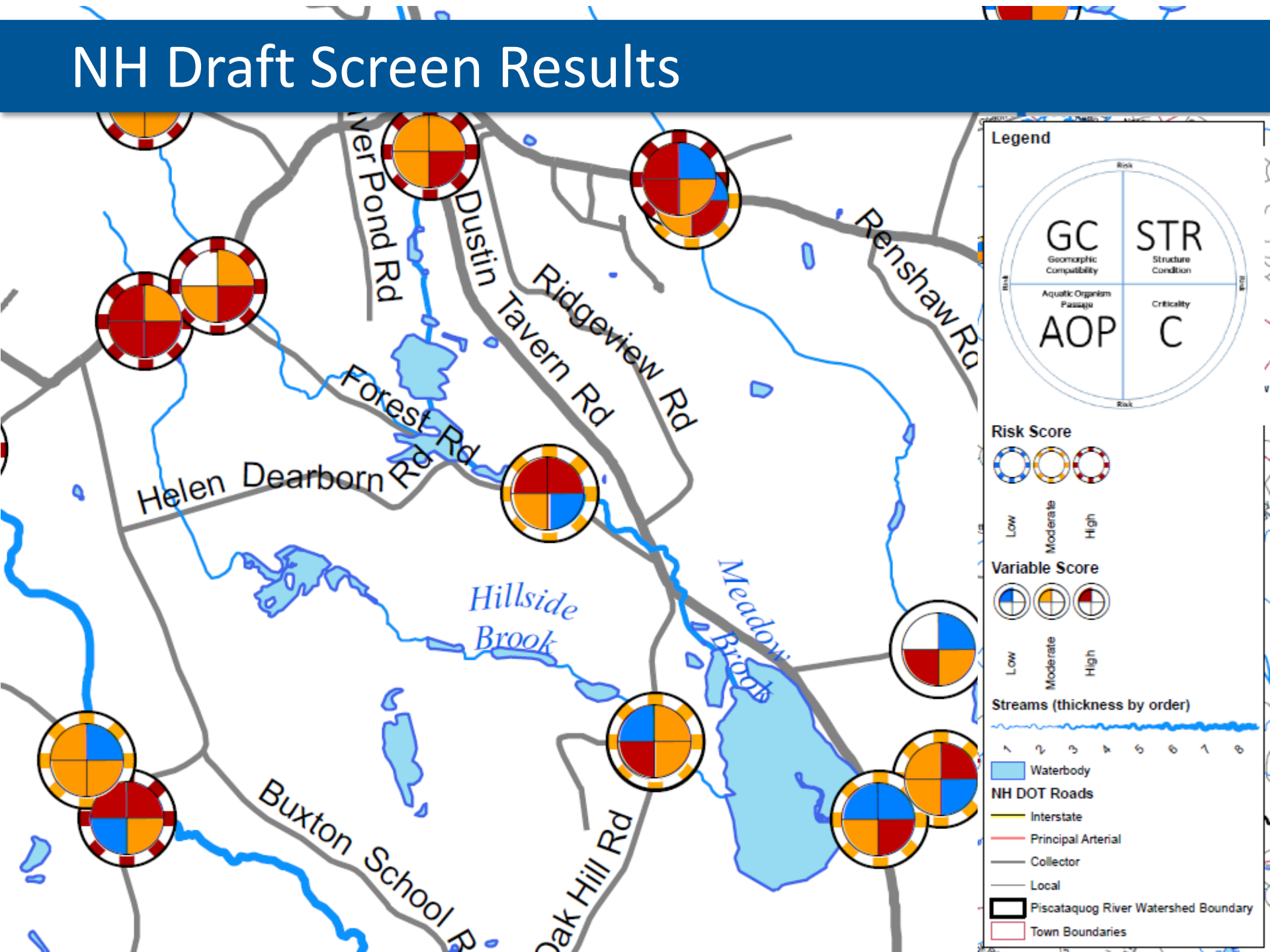
Risk Icon Examples



Lowest Risk | Low Risk | Moderate Risk | High Risk | Highest Risk

Prepared May 2016

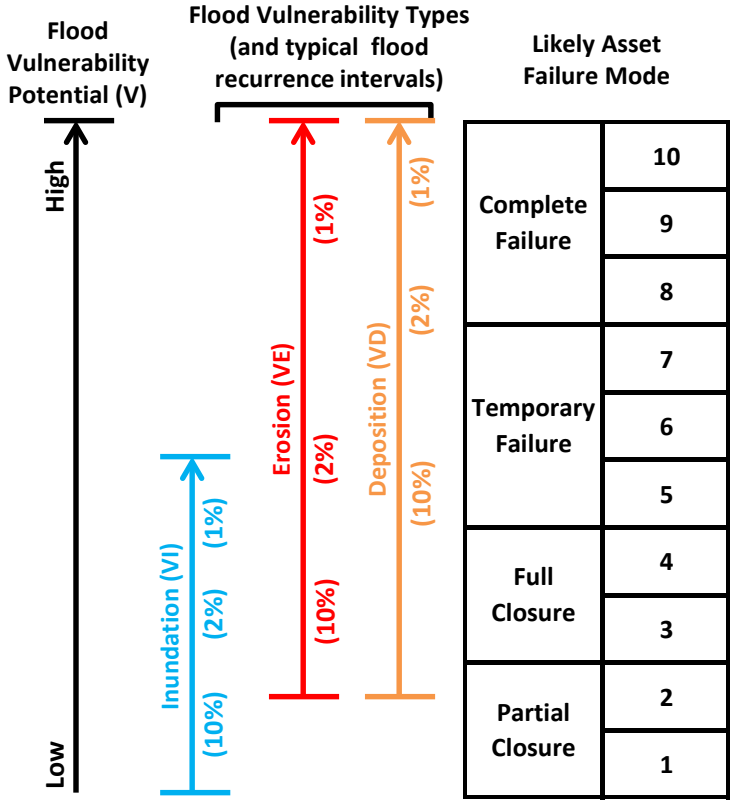
NH Draft Screen Results



VT Road Vulnerability Assessment

$$\text{Vulnerability} = \sum_{I,E,D} V_{\text{ROAD SEGMENT}} = \sum_{I,E,D} (V_{\text{EMBANKMENT}} + V_{\text{BRIDGES}} + V_{\text{CULVERTS}})$$

where I = inundation, E = erosion and D = deposition



THANK YOU.

←Former culvert

(MMI, 2015)

New culvert→

HIGH RESILIENCY = HIGH CONNECTIVITY